

# **AIR FORCE QUALIFICATION TRAINING PACKAGE (AFQTP)**



for  
**ELECTRICAL POWER PRODUCTION  
(3E0X2)**

**MODULE 19  
COOLING SYSTEMS**

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Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

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**Notice.** This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

**AIR FORCE QUALIFICATION TRAINING PACKAGES**  
**for**  
**ELECTRICAL POWER PRODUCTION**  
**(3E0X2)**

**INTRODUCTION**

*Before starting this AFQTP*, refer to and read the “Trainee/Trainer Guide” located on the AFCEA Web site <http://www.afcesa.af.mil/>

*AFQTPs are mandatory and must be completed* to fulfill task knowledge requirements on core and diamond tasks for upgrade training. *It is important for the trainer and trainee to understand* that an AFQTP does not replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

*AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.*

**MANDATORY minimum upgrade requirements:**

***Core task:***

AFQTP completion  
Hands-on certification

***Diamond task:***

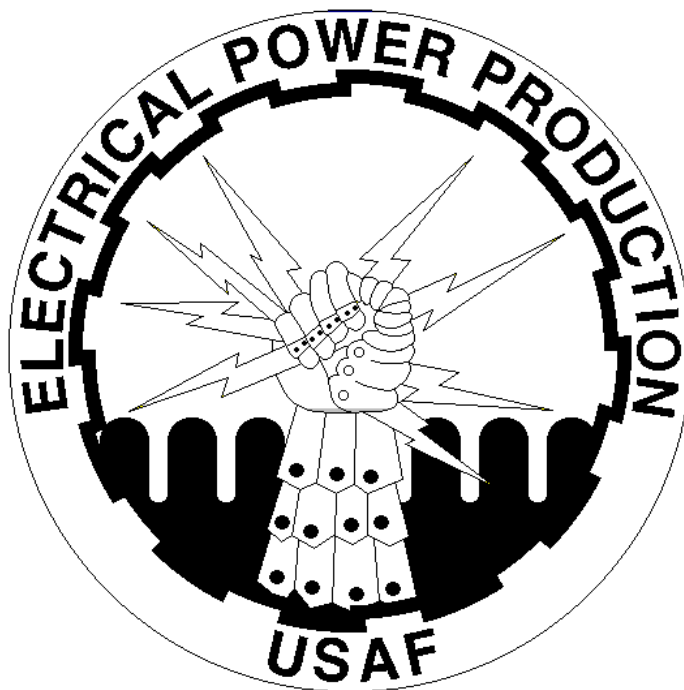
AFQTP completion  
CerTest completion (80% minimum to pass)

**Note:** *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

***Put this package to use.*** Subject matter experts under the direction and guidance of HQ AFCEA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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## COOLING SYSTEMS

MODULE 19

AFQTP UNIT 2

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SERVICE (19.2.)

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**SERVICE*****Task Training Guide***

<b>STS Reference Number/Title:</b>	19.2. Service
<b>Training References:</b>	<ul style="list-style-type: none"> <li>• CD-ROM, (3E0X2-19C, Cooling Systems)</li> <li>• 35C2 series Technical Orders, MEP Generators</li> <li>• AFOSH 127-45</li> <li>• Military Specification MIL-C-10597</li> <li>• Manufacturer's Manuals</li> <li>• Local Procedures</li> </ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Possess as a minimum, a 3E032 AFSC</li> </ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"> <li>• General tool kit and applicable TO</li> <li>• Personal safety equipment</li> <li>• Hydrometer</li> <li>• Suitable container</li> </ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"> <li>• Identify when and how specific maintenance procedures are performed on cooling systems for mobile diesel generators</li> </ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"> <li>• Service, drain, clean and flush, cooling system</li> <li>• Safely add corrosion inhibitor to the cooling system</li> </ul>
<b>Notes:</b>	
<ul style="list-style-type: none"> <li>• To successfully complete this element, follow the steps outlined in the applicable technical manual exactly—no exceptions</li> <li>• Any safety violation is an automatic failure</li> <li>• Prior to performing any maintenance, technician MUST isolate the starting system, and apply lockout and tag-out procedures</li> <li>• The MEP-007 is the generator set used unless otherwise stated</li> </ul>	

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## SERVICE

**Background:** The purpose of the cooling system is to transfer the heat generated by the engine to some outside source. Coolant circulates throughout the engine to accomplish this task. The importance of proper cooling system maintenance cannot be over-stressed. It is the purpose of this lesson to explain the maintenance requirements for cooling system components. The conventional cooling systems used on diesel engines are the open-type, closed-type, and air-cooled systems.

***To perform these tasks, complete:*** CD-ROM Version 1.0, 3E0X2-19C, Cooling Systems.

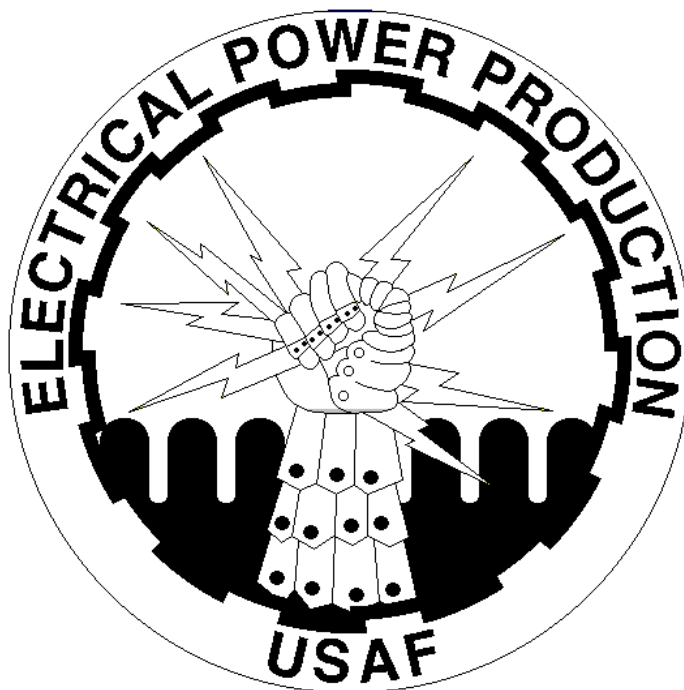
**NOTE:** In the CD-ROM there are tests after each section. Complete each section and answer the questions.

## SERVICE

Performance Checklist		
Step	Yes	No
1. Isolated the engine from starting		
2. Used lockout/tagout procedures		
3. Properly tested the coolant in the engine		
4. Ensured the engine wasn't too hot to perform service		
5. Properly drained and flushed cooling system		
6. Properly serviced coolant system with an approved corrosion inhibitor		
7. Changed all applicable filters		
8. Properly mixed the antifreeze with water before pouring it into the engine		
9. Properly refilled the coolant system and bleed off excessive trapped air		
10. Reconfigured engine for operation and removed lockout/tagout devices		
11. Performed a functional test at operating temperature		
12. Retested the coolant to ensure proper specific gravity		
13. Documented maintenance on AF Form 719		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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## COMPONENTS

MODULE 19

AFQTP UNIT 3

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INSPECT (19.3.1.)

REPAIR (19.3.2.)

REPLACE (19.3.3.)

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**COOLANT SYSTEM  
INSPECT  
REPAIR  
&  
REPLACE**

***Task Training Guide***

<b>STS Reference Number/Title:</b>	19.3.1., Inspect 19.3.2., Repair 19.3.3., Replace
<b>Training References:</b>	<ul style="list-style-type: none"> <li>• CD-ROM, (3E0X2-19C, Cooling Systems)</li> <li>• 35C2 series Technical Orders, MEP Generators</li> <li>• Manufacturer's Manuals</li> <li>• Local Procedures</li> <li>• Lockout/tagout Procedures</li> </ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Possess as a minimum, a 3E032 AFSC</li> </ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"> <li>• General tool kit</li> <li>• Personal safety equipment</li> <li>• MEP- 007</li> </ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"> <li>• Repair and replace cooling system components.</li> </ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"> <li>• The trainee should be able to repair and/or replace the following: <ul style="list-style-type: none"> <li>• Water pump</li> <li>• Water manifold</li> <li>• Fan blades</li> <li>• Radiator</li> <li>• Coolant thermostat</li> <li>• Heat exchanger</li> </ul> </li> </ul>
<b>Notes:</b>	
<ul style="list-style-type: none"> <li>• To successfully complete this element, follow the steps outlined in the applicable technical manual exactly—no exceptions</li> <li>• Prior to performing any maintenance, technician MOST isolate the starting system, and apply lockout and tag-out procedures</li> <li>• Any safety violation is an automatic failure</li> </ul>	

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**INSPECT  
REPAIR  
&  
REPLACE**

**Background:** The purpose of the cooling system is to transfer the heat generated by the engine to some outside source. Coolant circulates throughout the engine to accomplish this task. The importance of proper cooling system maintenance cannot be over-stressed. It is the purpose of this lesson to explain the maintenance requirements for cooling system components. The conventional cooling systems used on diesel engines are the open-type, closed-type, and air-cooled systems.

***To perform these tasks, complete: CD-ROM Version 1.0, 3E0X2-19C, Cooling Systems.***

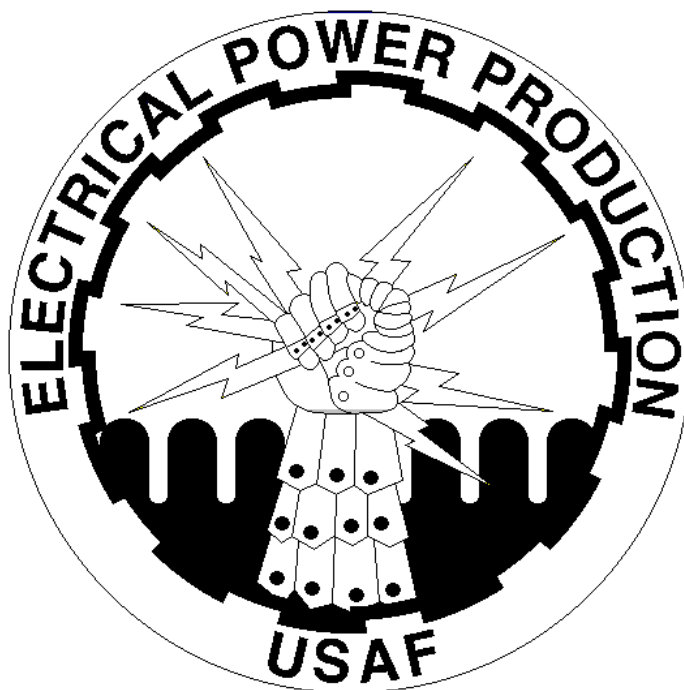
<p><b>NOTE:</b> In the CD-ROM there are tests after each section. Complete each section and answer the questions.</p>
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**COOLANT SYSTEM  
INSPECT  
REPAIR  
&  
REPLACE**

Performance Checklist		
Step	Yes	No
1. Safely isolated the engine from starting		
2. Used lockout/tagout procedures		
3. Had applicable TO or Manual		
4. Repaired and replaced water pump		
5. Replaced water manifold		
6. Repaired and replaced radiator		
7. Repaired and replaced coolant thermostat		
8. Repaired heat exchanger.		
9. Re-service the coolant system		
10. Reconfigured engine for operation and removed lockout/tagout devices		
11. Performed a functional test at operating temperature		
12. Documented maintenance on AF Form 719		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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## COOLING SYSTEMS

**MODULE 19**

**AFQTP UNIT 5**

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**TROUBLESHOOT (19.5.)**

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**TROUBLESHOOT*****Task Training Guide***

<b>STS Reference Number/Title:</b>	19.5., Troubleshoot
<b>Training References:</b>	<ul style="list-style-type: none"> <li>• CD-ROM, (3E0X2-19C, Cooling Systems)</li> <li>• 35C2 series Technical Orders, MEP Generators.</li> <li>• Manufacturer's manuals.</li> <li>• Local procedures.</li> </ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Possess as a minimum, a 3E032 AFSC.</li> </ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"> <li>• General tool kit.</li> <li>• Personal safety gear.</li> <li>• Cooling system</li> </ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"> <li>• Troubleshoot cooling systems.</li> </ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"> <li>• The trainee should troubleshoot cooling system for above-normal operating temperatures.</li> <li>• The trainee should troubleshoot cooling system for below normal operating temperatures.</li> </ul>
<b>Notes:</b>	
<ul style="list-style-type: none"> <li>• To successfully complete this element, follow the steps outlined in the applicable technical manual exactly—no exceptions.</li> <li>• Any safety violation is and automatic failure.</li> </ul>	

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## TROUBLESHOOT

**Background:** While the engine is operating, you may encounter abnormal engine operating temperatures. Your ability to quickly isolate and determine the cause of the malfunction will directly determine how you affect the system it is supporting and the mission. The ability to effectively troubleshoot is the one of the most if not the most important part of our job.

*To perform these tasks, complete: CD-ROM Version 1.0, 3E0X2-19C, Cooling Systems.*

**NOTE:** In the CD-ROM there are tests after each section. Complete each section and answer the questions.

**TROUBLESHOOTING**

<b>Performance Checklist</b>		
<b>Step</b>	<b>Yes</b>	<b>No</b>
1. Troubleshoot cooling system for above-normal operating temperatures		
2. Troubleshoot cooling system for below-normal operating temperatures		
3. Performed safety procedures		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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